SECTION 12

PART B

INDEPENDENT POWER TAKE OFF

Indepedent power take off

Part B

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12B . 1 IPTO - SPECIFICATION :

Lift pump output:		
540 rev/min PTO speed – Low flow pump	-	1789 engine rev/min
Engine to PTO shaft ratio:		
Low flow pump	-	3.313:1
PTO shaft:		
Out side diameter	-	1.3752 inch (34.93 mm)
No. of splines	-	6
IPTO clutch :		
Type	-	Multiplate
Size	-	4.921 inch (125 mm)
Operation	-	Hydraulic
No. of Friction discs	-	5 For MF 2605
	-	7 For MF 2615
Thickness (new)	-	0.086 inch (2.2 mm)
No. of steel plates	-	4 For MF 2605.
	-	6 For MF 2615
Thickness (new)	-	0.062 inch (1.6 mm)
No. of return springs	-	4
Type of spring	-	Coil
Clutch pressures:		
Engine speed	-	1500 rev/min
Oil temperature	-	122°F - 140°F (50-60° C).
Clutch operating pressure	-	18 .63 - 19.61 bar (270 - 285 psi)

12B . 2 GENERAL DESCRIPITION:

Single – Speed IPTO – Low flow Pump

The PTO drive is taken from the hydraulic lift pump running at a speed of 540 rpm giving a hydraulic flow of 16.7 lpm (4.4 gpm) at an engine speed of 1789 rpm.

The principal components of single speed IPTO comprise of hydraulic – operated multi-plate clutch and a electrical solenoid valve, operated by a Single Pole Double Throw Switch.

The IPTO clutch is located immediately to the rear of the linkage pump and is driven from an extension of the linkage pump drive shaft. This shaft is driven from the cover of the split torque transmission clutch, through the PTO reduction gears and drive shaft to the pump.

The rear extension shaft of the linkage pump is splined and is coupled with splined input shaft of the IPTO clutch assembly. The input shaft is connected through splines to a hub, which in turn is splined to seven (in MF2615 tractor) / five (in MF2605 tractor) Friction clutch discs (Friction material – Paper based). Six (in model MF2615)/four (In MF2605) corresponding inter clutch plates connected to the housing of IPTO clutch. Four springs on the IPTO clutch housing holds the clutch in the disengaged position and applies required brake torque. The main PTO shaft is splined to the output gear of the clutch assembly, connected to the clutch housing.

Rotation of the PTO shaft is controlled by the hydraulic clutch. It occurs when the driving friction plates and the driven (inter steel plates) are forced into engagement by the piston, this is operated by oil pressure through the left-hand side cover from solenoid valve and auxiliary hydraulic system.

The solenoid valve located outside the center housing and below the LH foot step acts as a direction control valve and maintains a constant pressure at a constant flow, to the clutch assembly, through hydraulic pipe lines via the LH side cover.

The solenoid valve is operated to 'ON' condition, by IPTO switch, located on ROPS, on the Right Hand side, near the driver's seat. For safety, this switch has two-way action of pressing the switch in the center and pulling the switch upwards direction for 'ON' condition. When the solenoid valve is switched 'ON', it directs oil to the back of the piston, overcomes the four spring forces and engages clutch assembly at a constant pressure of 18 .63 - 19.61 bar (270 - 285 psi) and constant flow of 9 lpm (2.377 gpm). Oil is vented out from the between the plates through the slots on the housing, provided for the inter plates.

When the solenoid valve is switched 'OFF' (by pressing the IPTO switch downwards), the solenoid valve directs the oil from the auxiliary hydraulic system to the sump (Center housing), thus with drawing flow to the clutch assembly and disengaging the same.The four springs located in the housing ensures a fast return oil flow and a rapid disengagement of the clutch.The four springs also applies the brake by forcing the housing against a friction liner plate in the clutch assembly.This brake friction liner plate lug is held in between the Assembly Brake bracket, fastened inside the center housing.

When the IPTO switch is in 'OFF' condition (clutch disengaged condition), the neutral start switch is engaged.

The hydraulic system is fitted with a flow control valve, fastened to the LH side cover (towards the inside of the center housing), which regulates a constant flow of 9 lpm (2.377 gpm) to solenoid valve. The solenoid valve acts as a direction control valve, maintains a constant pressure at particular flow and as a modulating valve. The solenoid valve controls the rate of engagement of the clutch, by controlling the flow of oil into the clutch pack so that the engagement time is approximately with in 1.2 to 1.5 seconds, this prevents the clutch taking up the drive suddenly which could result in damage to the tractor or the implement. The settings of the flow control valve and the solenoid valve is factory set and are not adjustable.

12 B . 3 IPTO Operating switch:

The tractor is fitted with independent electrohydraulic controlled PTO clutch.

- Switch control for the power take off (B)

Do not leave the power take off clutch switch engaged longer than the time required for the operation. Always place the power take off clutch in neutral , shut off engine and engage parking brake before carrying out any adjustment or repair jobs on the implement connected to it.

1. To engage the PTO clutch,press (B) the switch (B) in the center , lift the outer ring and pull up .The selected PTO speed indicator light on the instrument panel illuminates.
2. To disengage press the switch down.

Note:*The PTO engagement switch must be in the neutral / brake position (Fully down) to engage the neutral start switch so the engine can be started.*

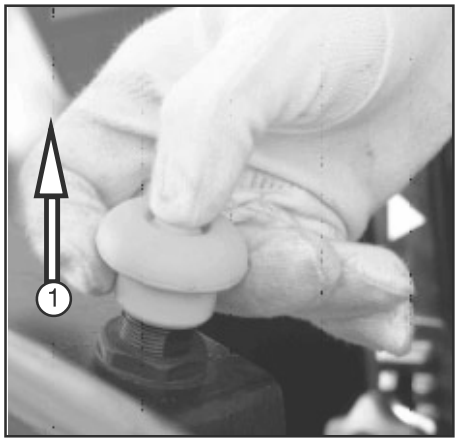

Fig 1

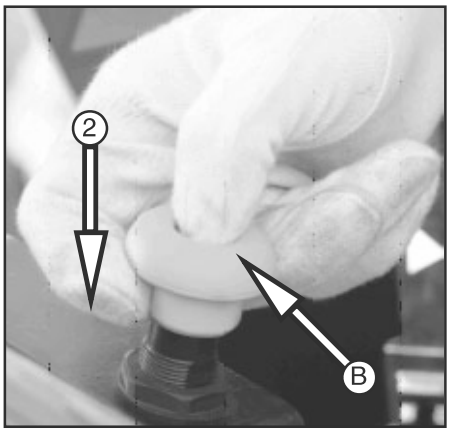

Fig 2

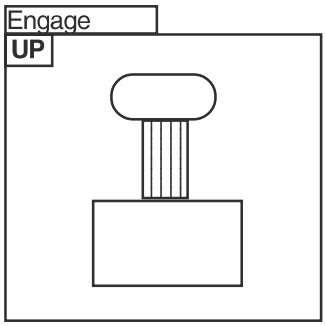

Fig 3

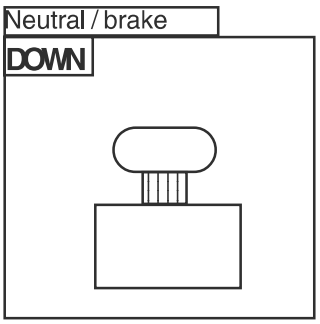

Fig 4

LAYOUT 2WD IPTO CLUTCH

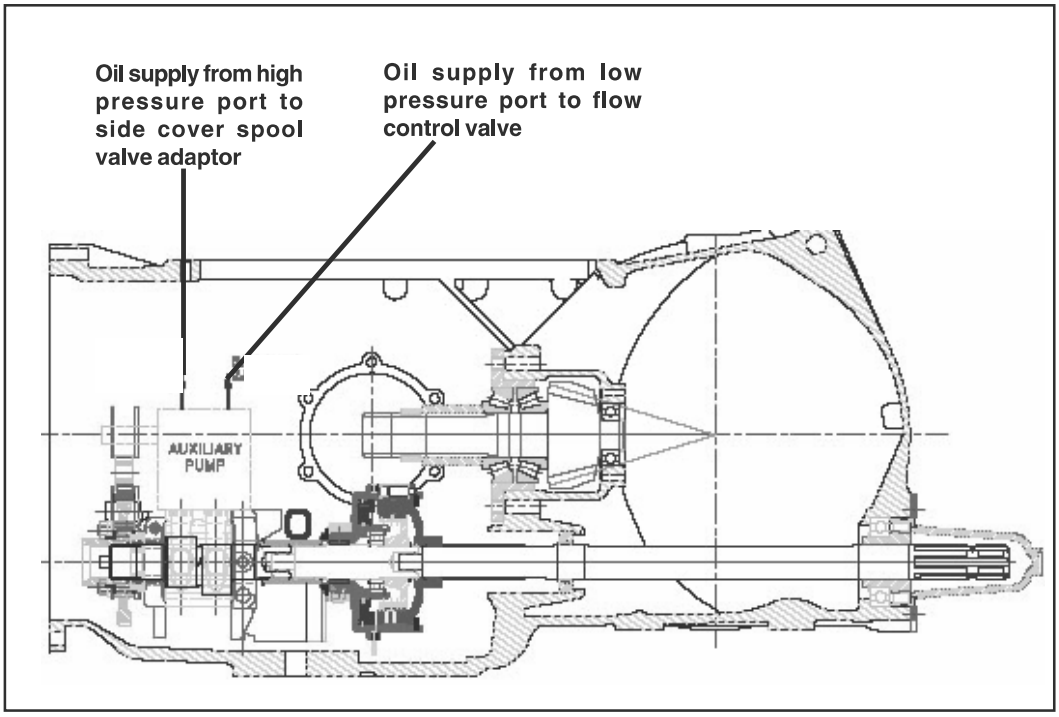
Oil supply from high pressure port to side cover spool valve adaptor
Oil supply from low pressure port to flow control valve
AUXILIARY PUMP

Fig 5

LAYOUT 4WD IPTO CLUTCH

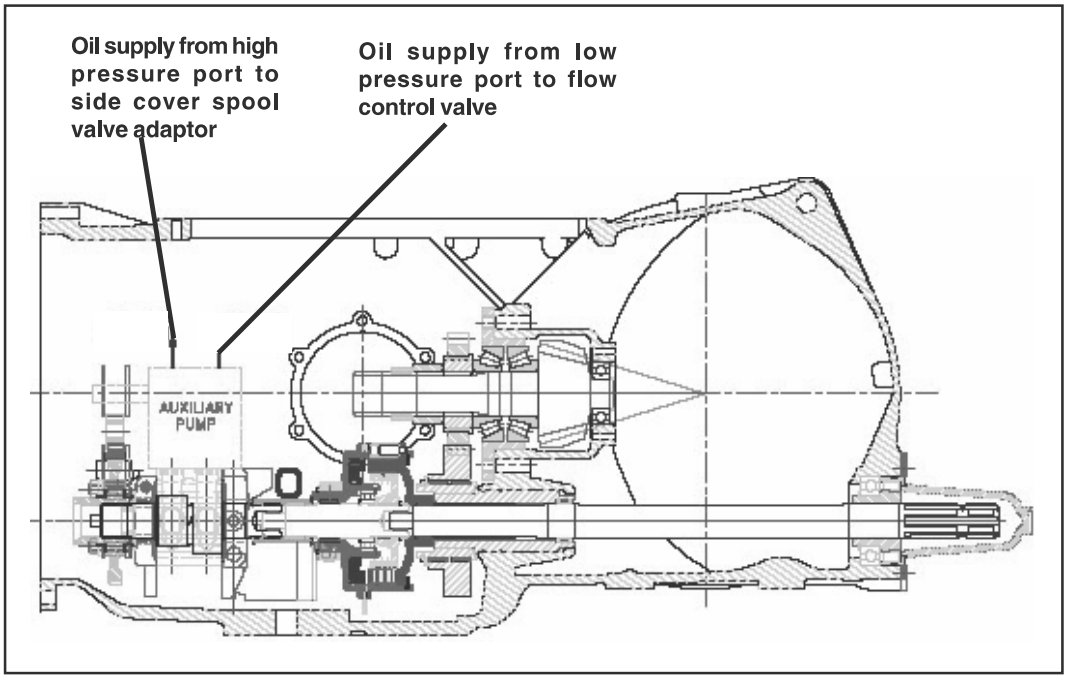
Oil supply from high pressure port to side cover spool valve adaptor
Oil supply from low pressure port to flow control valve
AUXILIARY PUMP

Fig 6

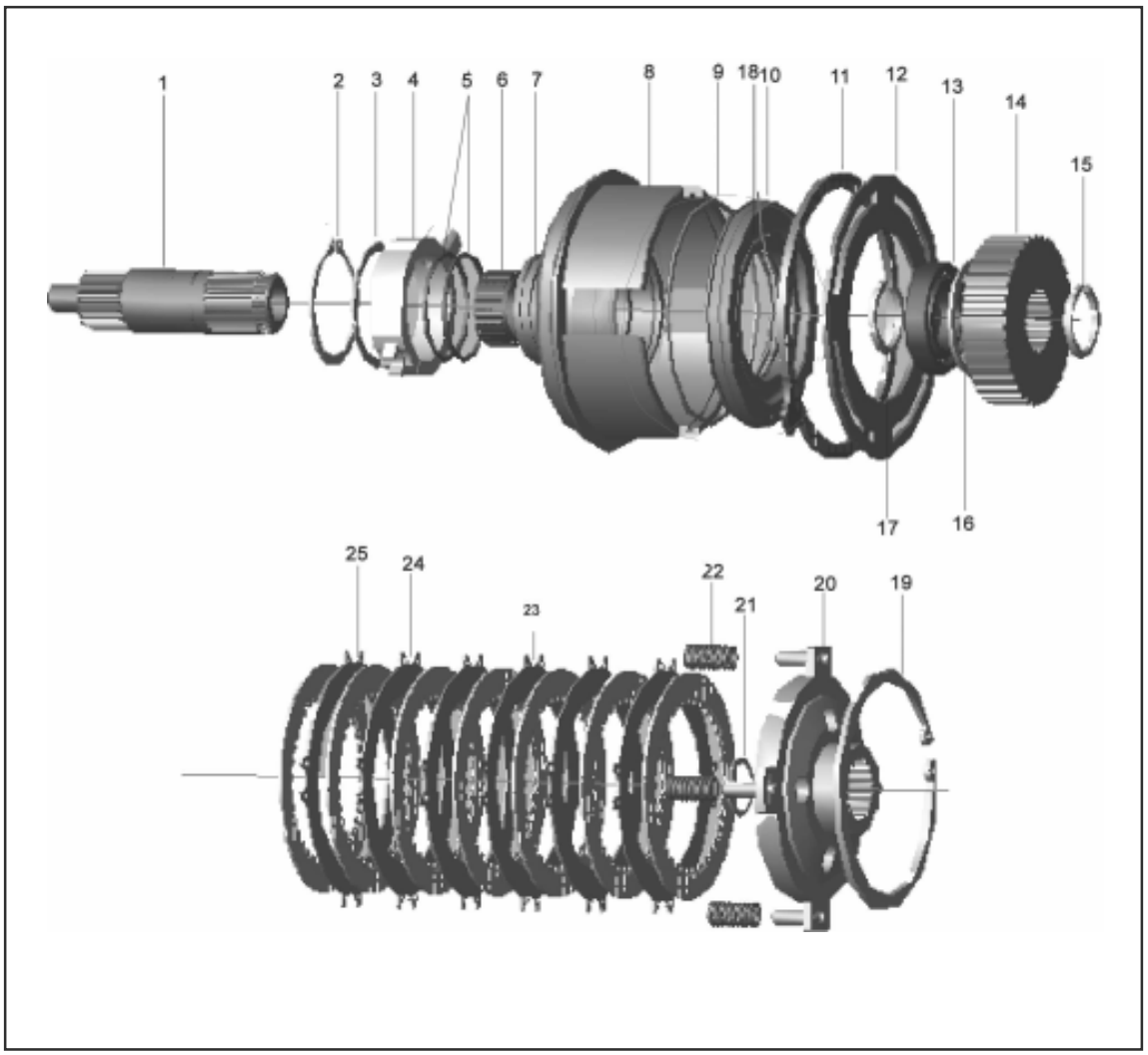

Fig 7

S.no	Descripition	Qty
1	Input shaft	1
2	Snap ring	1
3	Lock plate	1
4	Feed ring	1
5	Seal ring	2
6	Needle bearing	1
7	AV - Seal	1
8	Case	2
9	Seal ring	1
10	Piston	1
11	Brake disc	1
12	Brake plate	1
13	Ball bearing	1
14	Hub	1

S.no	Descripition	Qty	
15	Snap ring (shaft)	1	
16	Snap ring (Hole)	1	
17	Snap ring (shaft)	1	
18	Seal ring	1	
19	Snap ring (Hole)	1	
20	Pressure plate	1	
21	Snap ring (Hole)	1	
22	Spring	4	
23	Rubber separator	16	For 2615
		12	For 2605
24	Clutch disc	7	For 2615
		5	For 2605
25	Clutch plate	6	For 2615
		4	For 2605

12B . 4 IPTO CLUTCH UNIT

Removal and Refitment from tractor

1. Split the tractor between the rear centre housing and the range change unit, four-wheel drive drop box or spacer.(See operation 4A . 4)
2. Remove the lift cover.(See operation 11A . 5)
3. Remove the left-hand side cover, (see operation 12B . 7).
4. Remove the main drive shaft.
5. Remove the access plate, the hydraulic lift pump filter and stud extension.
6. Remove the two nuts and dowel pin on the left-hand side of the transmission case holding the lift pump. Remove the strainer housing on the right-hand side.
   NOTE: *The following procedure must be carefully followed otherwise extreme difficulty will be experienced in removing the pump.*
7. The lift pump and IPTO clutch pack must be held together and removed as one unit.
8. Carrying out the instructions in procedures 7 and 8, hold the lift pump and IPTO clutch pack assembly, manoeuvre the assembly forwards out of the centre housing.
9. Slide the clutch pack assembly off the lift pump drive shaft.
10. Remove the thrust washer .
11. Remove the coupler.
12. Remove the thrust washer.
13. Remove the snap ring.

Refitment

14. Refit the clutch assembly to the lift pump.
15. Ensure that the fork on the feed ring is correctly engaged on the pin on the lift pump.
16. Ensure that the brake disc lug of clutch assembly to be positioned between brake bracket fingers.
17. Reverse procedures 1 to 13 except:
    a. Fit new 'O' rings, gaskets and split pins.
    b. DO NOT tighten the two lift pump dowel nuts (5) until the transmission has been completely reassembled.

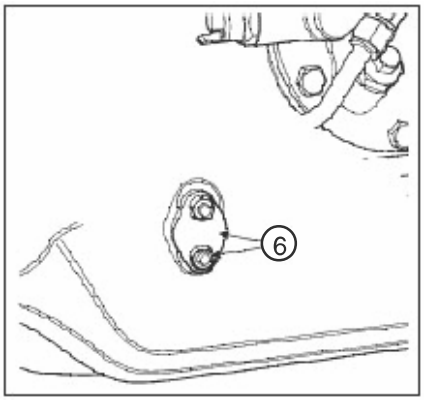

Fig 8

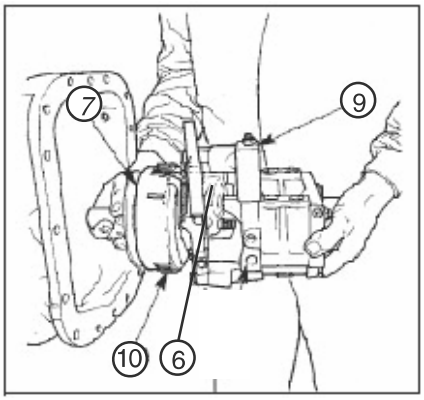

Fig 9

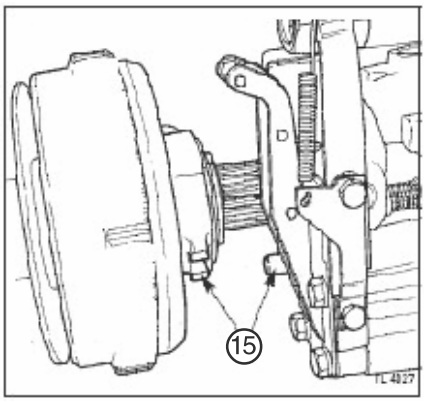

Fig 10

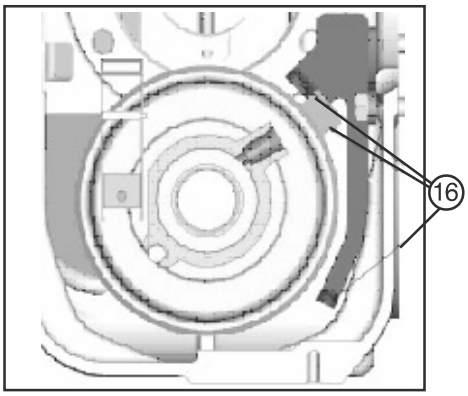

Fig 11

12B . 5 IPTO Clutch unit :

over hauling:

Removal

1. Press the pressure plate and remove the Snap ring using circlip plier.

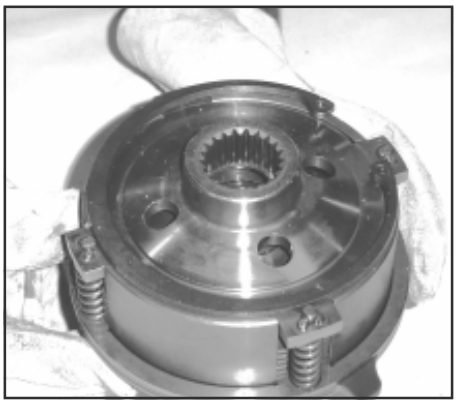

Fig 12

2. Remove the pressure plate.

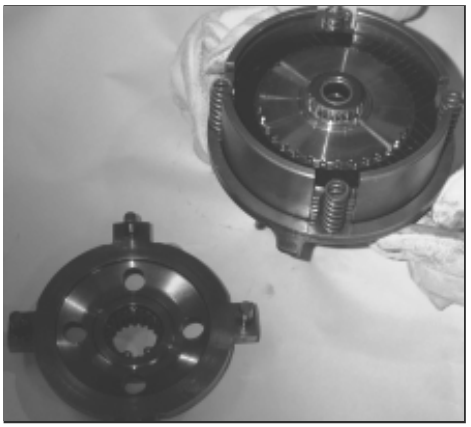

Fig 13

3. Remove the four springs.

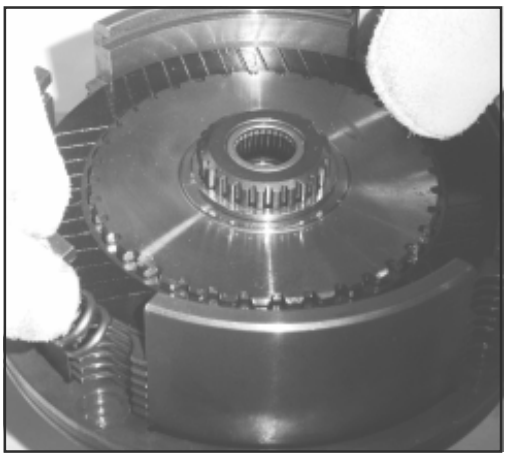

Fig 14

4. Remove the clutch disc and clutch plate one by one.

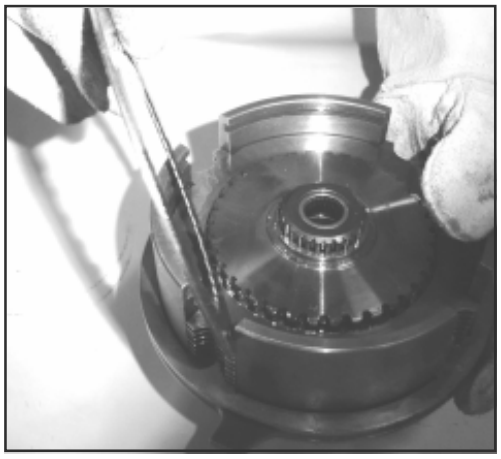

Fig 15

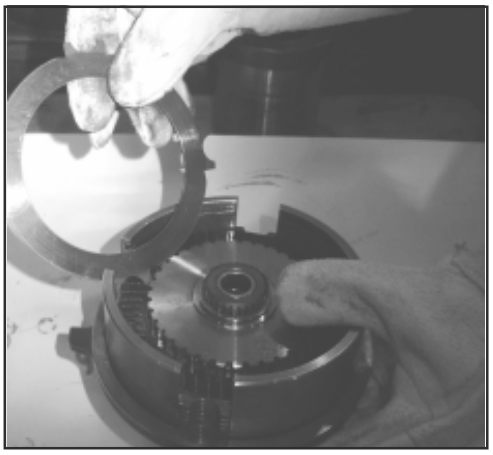

Fig 16

5. Remove the brake plate.

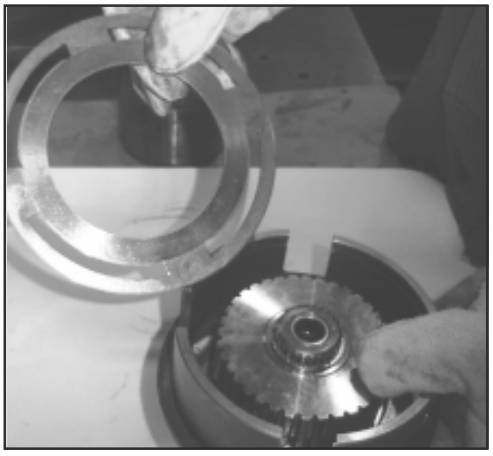

Fig 17

6. Remove the brake disc.

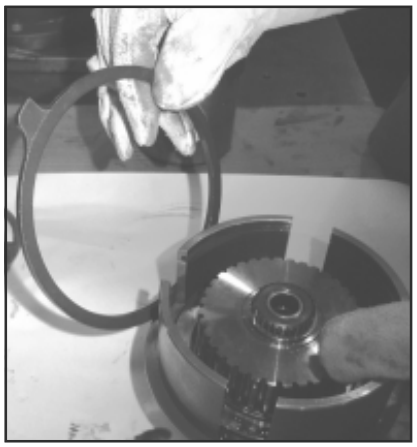

Fig 18

7. Remove the snap ring by using circlip plier from input shaft.

Fig 19

8. Remove the hub.

Fig 20

9. Remove the internal snap ring from inner case.

Fig 21

10. Pull the shaft forward and remove the shaft from housing along with bearing and also remove the needle roller bearing from the shaft.

Fig 22

11. Remove the piston by passing the high pressure through the feed ring.

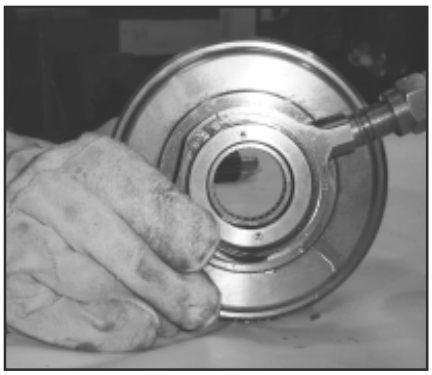

Fig 23

12. Remove the circlip from the rear side of the casing using circlip plier.

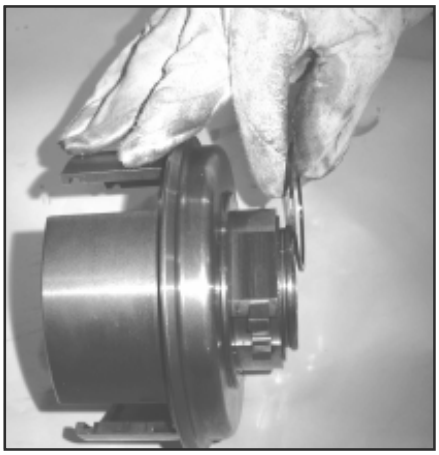

Fig 24

13. Remove the Feed ring .

Fig 25

14. Remove the Teflon carbon ring from the housing.

Fig 26

NOTE: Do not disturb the AV seal feed ring .

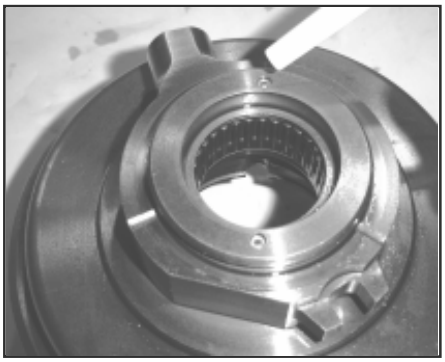

Fig 27

REFITMENT:

15. Reverse the procedure 1 to 14 except.

a.While refit the feed ring into the housing ensure the feed ring in its correct position .Measure the height between the housing and the feed ring (refer fig 28).

b.Replace the failured component by new one.

Note: *All disassembling and assembling operations are carried out in Dust free enviroment.*

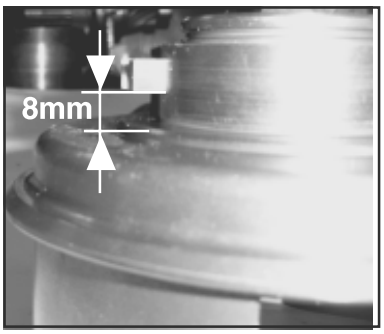

Fig 28

12 B - 6 IPTO Pressure test and flow test:

Before starting the test ensure that the transmission case is filled with clean transmission oil of the recommended grade oil.

1. Start the engine and warm up the transmission oil to a temperature of 120° - 140°F(50°c - 60°c) by running the hydraulic system under load.
2. Stop the engine and locate the outlet port of flow control valve to solenoid valve on left hand side cover.
3. From the left hand side cover, disconnect the line from the flow control valve outlet to the solenoid valve inlet.
4. Connect a 0 - 10 gpm (0 - 25 lpm) flow meter inlet line to flow control valve outlet port and the flow meter outlet line to the solenoid valve inlet port.
5. Restart the engine and increase the engine speed to 1500 rev / min.
6. The flow meter should read 2.37 (+0.264 / -0) gpm (9 (+1 / - 0) lpm) , flow rate. Stop the engine and reconnect the lines disconnected earlier.
7. Locate and remove the plug on left hand side cover for pressure test.
8. Fit the pressure gauge (upper limit 30 bar or 500 psi) at the pressure test point.
9. Restart the engine engage the IPTO and increase the engine speed to 1500 RPM.
10. With the transmission oil at the specified temperature the pressure reading should bulid up to 18 .63 - 19.61 bar (270 - 285 psi).With in a period of approximately 1.2 to 1.5 seconds,the minimum acceptable pressure is 15.7 bar (228 psi).
11. Reduce the engine speed to idling and disengage the IPTO.
12. Stop the engine,remove the gauge and refit the plug to test port.
13. Restart the engine, engage the IPTO and increase the engine speed to 1000 RPM, check for and repair any leaks of IPTO lines and at test plugs.

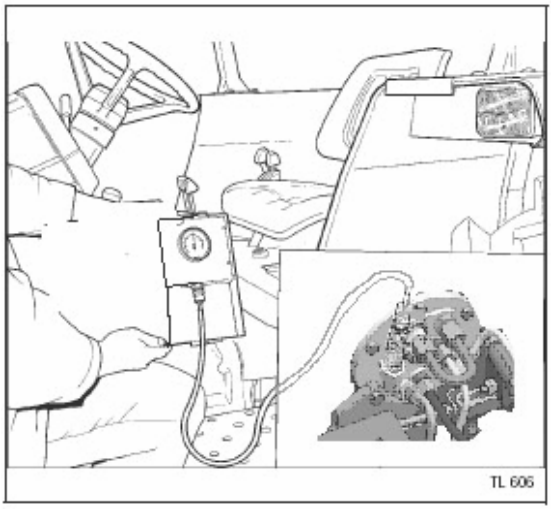

Fig 29

NOTE: *Flow control settings and solenoid valve settings are set at factory and should not be adjusted in service.*

Diagnosis for low oil flow:

1.If the flow is below the recommend specification, the following should be checked.

a.Leakage at hydraulic pump and the flow control valve.

b.Suction strainer for plugging.

c.Auxiliary hydraulic pump condition.

d.Oil level in the tractor should not be less than the minimum level on the dipstick.

Diagnosis for low oil pressure:

1. If the pressure is below the the minimum specification, the following should be checked:

a.Leakage at IPTO clutch pack ring.

b.Leaking in transfer pipe between side cover and clutch.

c.Leaking IPTO clutch pack piston seals.

12 B - 7 Left hand side cover

Removal and refitment :

Removal:

1. Park the vehicle on level ground and apply parking brake.
2. Pull the hood latch cable and lift the hood.
3. Disconnect the battery terminals.
4. Drain the oil from transmission and hydraulic.
5. Remove the U - Pipe connection.
6. Remove the 'O' ring.
7. Remove the left hand foot step for easy accessablity of solenoid valve pipes .

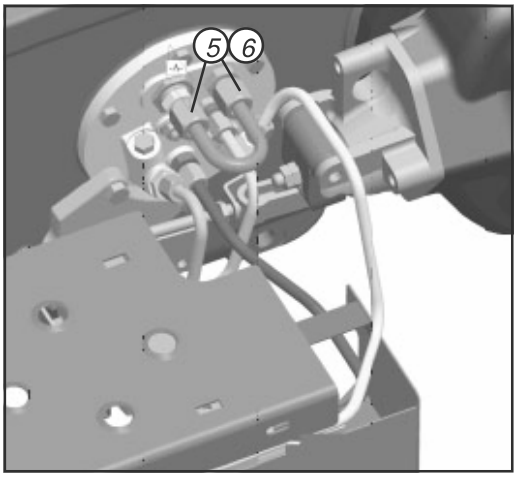

Fig 30

8. Remove the bracket mounting bolts.

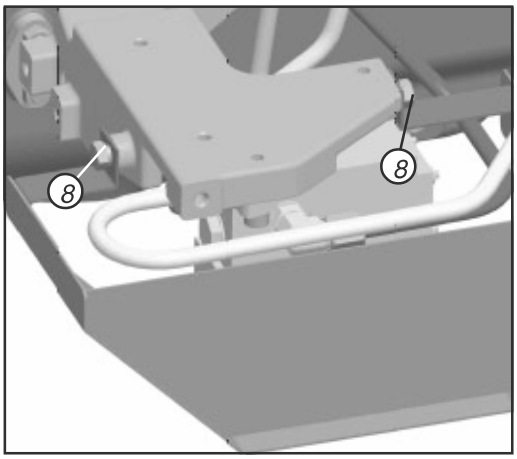

Fig 31

9. Remove the hydraulic lines which connects the side cover and the solenoid valve.

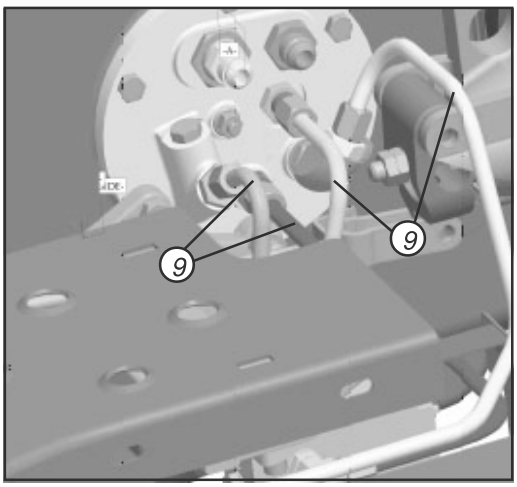

Fig 32

This picture shows the bottom view of solenoid valve with pipe connections.(For clarify)

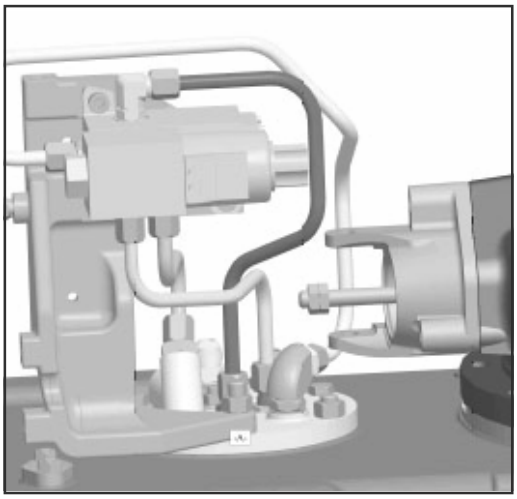

Fig 33

10. Remove the solenoid mounting allen screws.

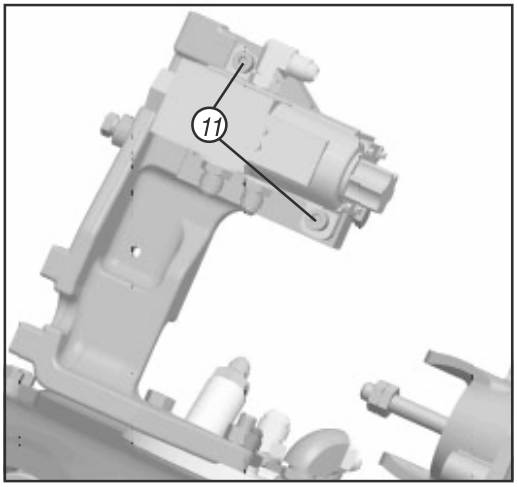

Fig 34

11. Remove the supply tube by using hook type tool.

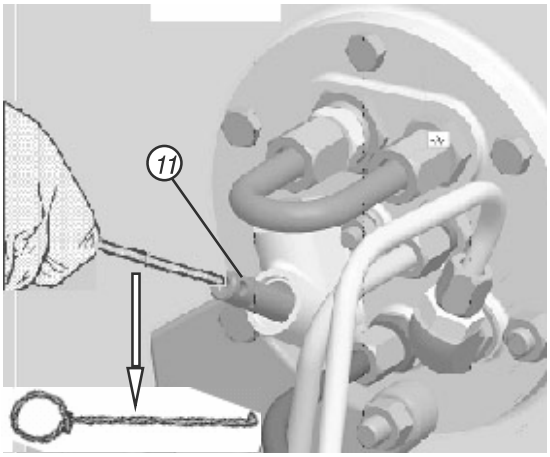

Fig 35

12. Remove the nuts.
13. Remove the 'O' rings.
14. Remove the solenoid valve mounting bracket bolts and remove solenoid valve mounting bracket.

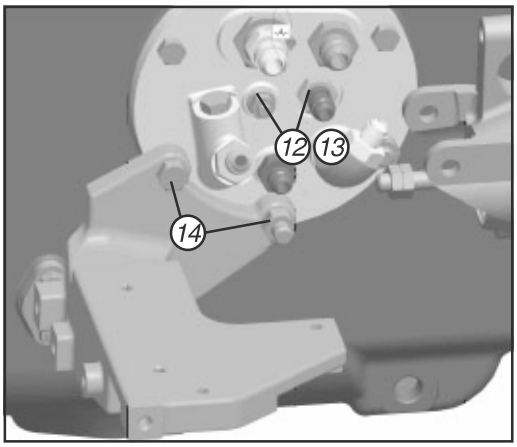

Fig 36

15. Remove the left hand side cover mounting bolts.
16. Remove the left hand side cover.
17. Remove the gasket.

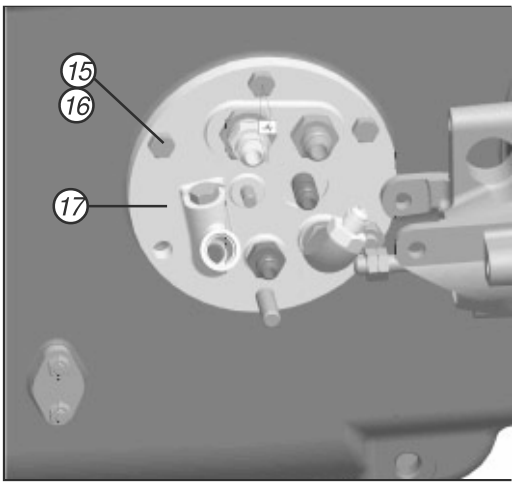

Fig 37

NOTE:Clean and inspect all the components and renew all the 'O' rings and gasket.

Refitment:

18. Reverse the procedure 1 to 17 except
Installation of supply tube:
a.Insert a guide rod to the feed ring through side cover as shown in figure.
b.Align the groove in the guide rod to side cover face.
c.Guide the supply tube over the guide rod to the feed ring and ensure the 31.5 mm height from side cover to supply tube.
d.Carefully remove the guide rod from the side cover and refit the bolt.
19. Seal the six bolts threads with Loctite and tighten the bolts.

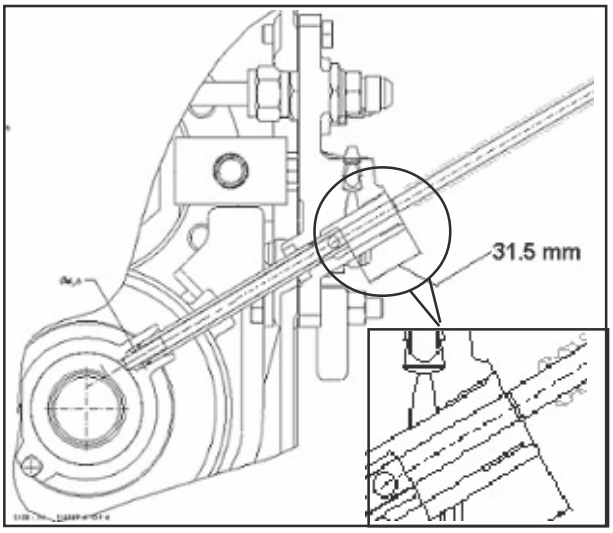

Fig 37